Best Practices for Road Weather Management

Version 3.0

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August 8, 2012

Briefing at 2012 Road Weather Management Stakeholder Conference

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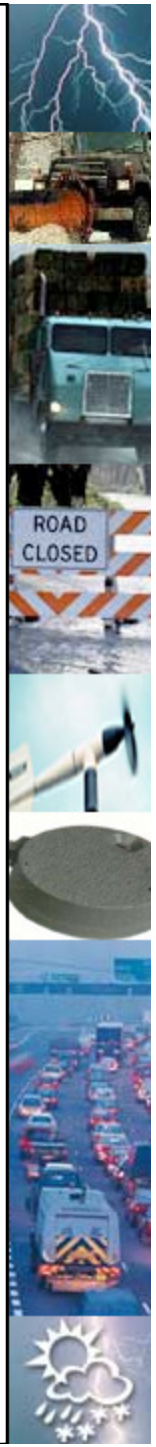
www.ops.fhwa.dot.gov/weather/index.asp



Agenda

- Mitigation strategies
- Need for best practice library (BPL)
- Development of BPL
- Illustrations of select best practices

Road Weather Management offers solutions

There are several mitigation strategies

- *Advisory*: informing motorists of road conditions in real-time or in advance of encountering adverse conditions
- *Control*: regulating motorist behavior on weather-affected road in order to achieve desired safety outcome
- *Treatment*: actively maintaining the road to minimize weather effects

Clear need to share best practices

The Best Practice Library (BPL)

Version 3.0

- ✓ compiles premiere state and local RWM practices
- ✓ disseminates on a national scale successful and proven RWM strategies and technologies
- ✓ Once published it will reside online at http://www.ops.fhwa.dot.gov/weather/mitigating_impacts/best_practices.htm

BPL development process was inclusive

Comprehensive state involvement was maintained throughout development

- Key state DOT staff in all 50 states invited to participate
- Template for case study provided with invitation
- Preliminary case studies reviewed and edited by FHWA personnel
- States provided final approval of case study

Mitigation strategies illustrated by selected best practices

- Advisory
  - **Florida:** Bridge Wind Speed Alerting System
  - **New Mexico:** Dust Control System
- Control
  - **Minnesota:** I-35W Smart Lanes
  - **Colorado:** Variable Speed Management
- Treatment
  - **Idaho:** Winter Maintenance Performance System
  - **Michigan:** Measurement of Regain Time

Examples of Advisory Strategies

NM: Dust Control System

FL: Bridge Wind Speed Alerting System

Florida: Bridge Wind Speed Alerting System

- *Challenge:* High winds across bridges pose a severe danger to motorists.

- *Solution:* Wind sensor deployed on bridge; system alerts FDOT if wind speed is above various thresholds. Warnings can be disseminated if needed.

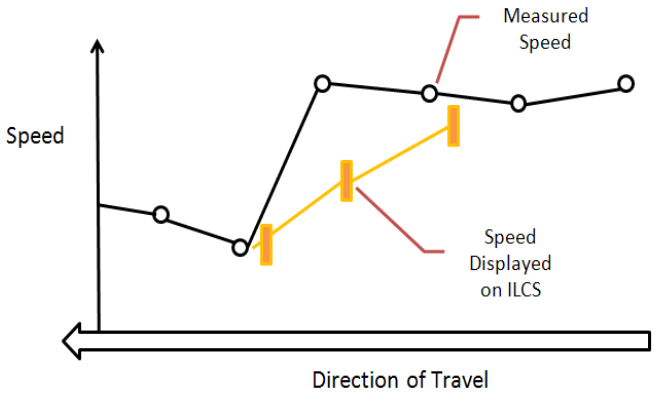
- *Outcome:* System provides a more efficient, safer and more accurate method to collect and disseminate wind speed than prior practices

New Mexico: Dust Control System

- *Challenge:* Stretches of Interstate 10 in New Mexico are prone to frequent dust storms, reducing visibility and travel speed for motorists

- *Solution:* A sensing system detects key parameters for dust storm formation, such as temperature, wind speed, and precipitation. This information is transmitted to NMDOT and used to predict and inform motorists of potential dust storms
- *Outcome:* Currently the system is in the evaluation phase

Examples of Control Strategies

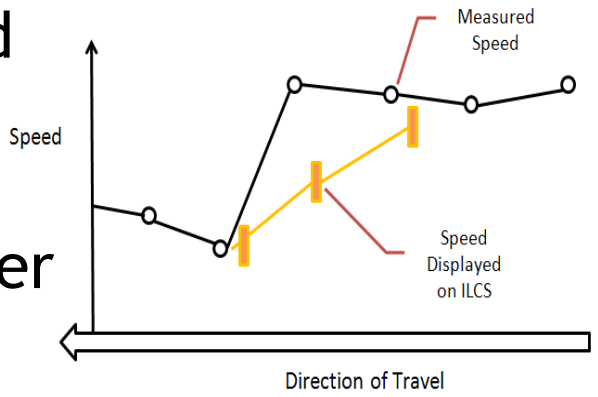


MN: I-35W Smart Lanes

CO: Variable Speed Management System

Minnesota: I-35W Smart Lanes

- *Challenge:* Road conditions and speed reductions along I-35W rapidly change due to traffic incidents and inclement weather



- *Solution:* Dynamic message signs above lanes control speed, based on weather conditions, and inform drivers of any lane closures

- *Outcome:* The system is enhancing the safety and improving traffic flow.

Colorado: Variable Speed Management System

- *Challenge:* Topography of State Highway 82 led to road icing induced by shading

- *Solution:* Road conditions determined automatically from sensory input (traction and precipitation). Information displayed on advance DMS

- *Outcome:* No weather-related incidents on managed section of State Highway 82 during first season of implementation

Examples of Treatment Strategies

ID: Winter Maintenance Performance System

MI: Measurement of Regain Time

Idaho: Winter Maintenance Performance System

- *Challenge:* A means was needed to evaluate the benefits of Idaho's winter maintenance program
- *Solution:* A system of 87 sensors will collect information on road surface characteristics and local weather. Also, maintenance data will be automatically tracked.

- *Outcome:* By understanding the effectiveness of various treatments appropriate maintenance responses can be applied, leading to improved safety and mobility for motorists

Michigan: Measurement of Regain Time

- *Challenge:* A metric was needed to determine the effectiveness of winter road maintenance
- *Solution:* Time measured between application of maintenance to return to average road speeds via microwave sensors

- *Outcome:* Effectiveness of various treatments along I-96 can now be compared using the metric of regain time

Next steps will enhance BPL

- Proposed development of a synthesis document
  - ✓ Will contain key elements of mitigation strategy development and implementation
  - ✓ Should provide a framework for states to design and build new RWM systems
- Biannual updates targeted due to fast pace of technological change in RWM
  - ✓ Please submit your RWM best practices to weatherfeedback@dot.gov

Acknowledgement of participating states

27 case studies on select road weather management practices from 22 states:

Alabama	Kansas	South Carolina
Alaska	Kansas City	South Dakota
Arizona	Maryland	Tennessee
California	Michigan	Texas
Colorado	Minnesota	Utah
Florida	Montana	Vermont
Idaho	New Mexico	
Iowa	Pennsylvania	

Last BPL update was in 2003: 30 case studies, 21 states

Weather-related Guidance for the Real-Time System Management Information Program (aka the 1201 Rule)

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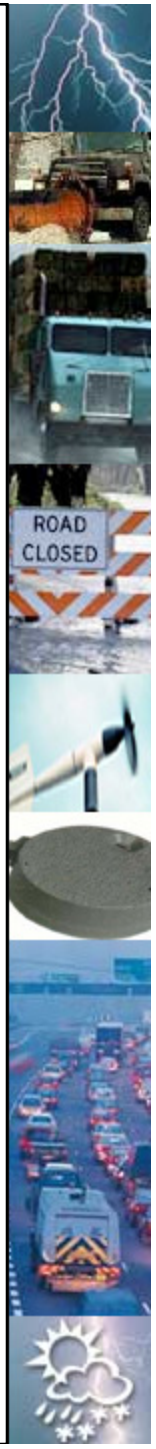


Background – Legislation

SAFETEA-LU, Subtitle B, §1201

- *Real-Time System Management Information Program*

  - Establish a real-time system management information program in all States
  - Monitor traffic & travel conditions of the major highways
  - Share information to address congestion problems and facilitate traveler information.

Background – Approach

- No new funding provided
  - Explicit Federal-aid eligibility under NHS, STP, CMAQ
- Technology & detailed approach agnostic
  - Information-based requirements
- Build off of existing systems
  - Most States currently have some information
- Codified by Final Rule as Part 511 of Title 23 of United States Code of Federal Regulations
  - 23 CFR Part 511

Provisions of 23 CFR Part 511 (1 of 2)

- **Two-stage implementation**
  - All Interstates within 4 years (November 2014)
  - Other metropolitan "Routes of Significance" as identified by States in collaboration with local agencies within 6 years (November 2016)
- **Information to be made available**
  - Construction lane and road closures
  - Road- or lane-blocking traffic incidents
  - Hazardous conditions & road or lane closures due to adverse weather
  - Travel times (in Metropolitan areas)
- **"Metropolitan" = greater than 1 million MSA**
  - New additions with 2010 Census: Salt Lake City, Raleigh

Provisions of 23 CFR Part 511 (2 of 2)

- **Regional ITS Architecture Update**
  - Regional architectures to be reviewed & updated as appropriate to ensure addressing RTSMIP provisions
- **Timeliness (age) of information**
  - Construction & Incident information within 20 minutes / within 10 minutes in Metro areas
  - Adverse weather conditions within 20 minutes
  - Travel times within 10 minutes
- **Quality measures**
  - Accuracy of 85%
  - Availability of 90%

Road Weather Observations

Information related to roadway weather observations is to be based on observed or verified conditions through whatever processes may be used by State and local agencies for their road weather management or inclement weather closure and warning systems, including coordination with police or other reporting agencies.

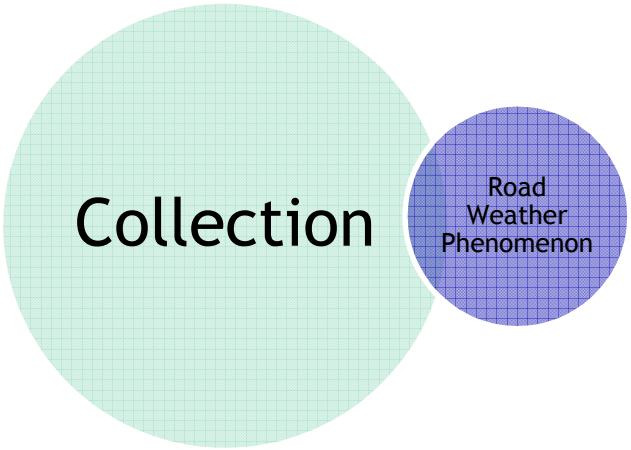
Collection


Frequency
Accuracy
Collection
Road Weather Phenomenon
Devices and or Personnel Used


ROAD
CLOSED

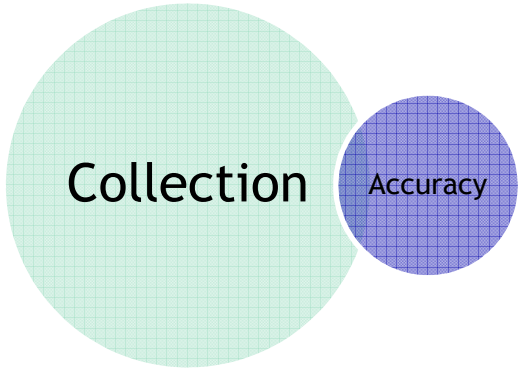
Road Weather Phenomenon

- Closure
- Restrictions (example)
  - Weight



- Hazardous Road Conditions (examples)
  - Visibility
    - Fog
    - Blowing Snow or Sand
  - Slick Roads
    - Ice
    - Snow

Accuracy

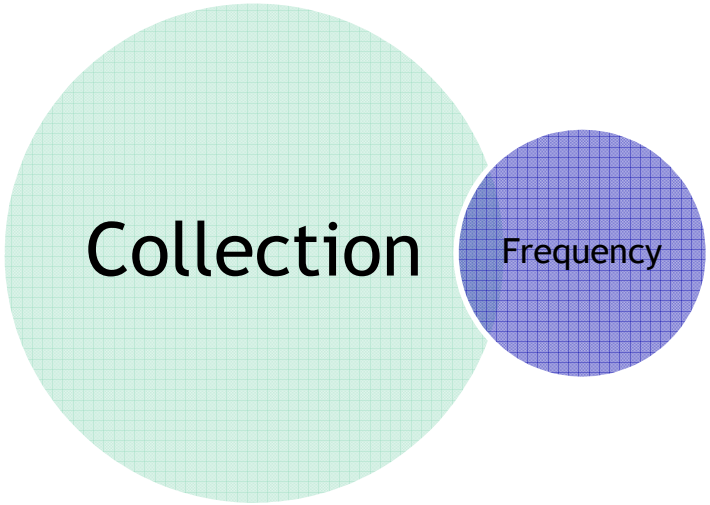


The designed accuracy for a real-time information program shall be 85 % percent accurate at a minimum, or have a maximum error rate of 15 %.

- *<u>Implementation Guidance</u>:*
  - *A systemic gauge of the **accuracy of the information available through the real-time system management information program**.*
  - *States and agencies should establish processes that measure and ensure the accuracy of the information from their RTSMIP consistent with the systems' design specifications.*
  - *For agency-owned systems, this may entail monitoring of individual sensors; and for information acquired from third-parties, the processes may include contract clauses or warranties. It is not intended that accuracy criteria be applied to individual data points or sensors in isolation.*

Frequency

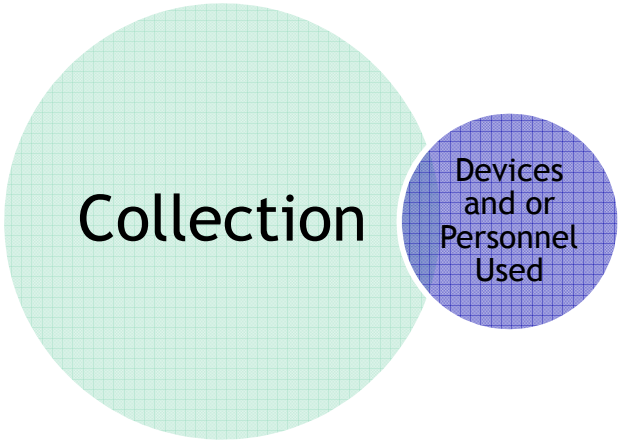
- Establish a collection / monitoring frequency of data that allows the road weather phenomenon to be made available in a timely manner. For example ~
  - RWIS observations
  - Scan of cameras
  - Drivers' feedback



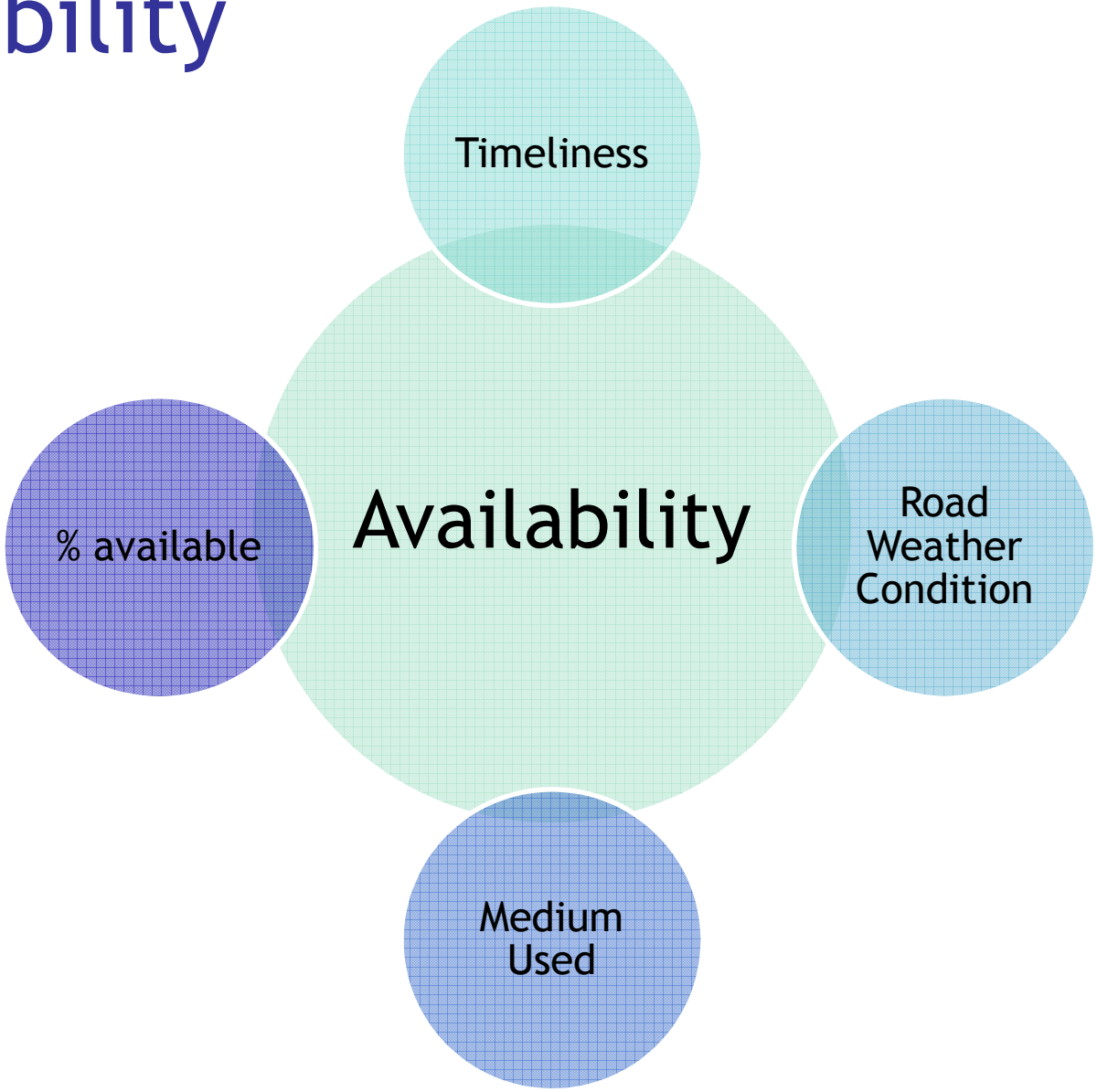
Devices &/or Personnel Used

Where can I get the data? (examples)

- RWIS
- Personnel on the road
  - DOT (maintenance, construction, supervisors, etc.)
  - Highway patrol
- Weather service providers
  - NWS, vendor, etc.
- MDSS



Availability

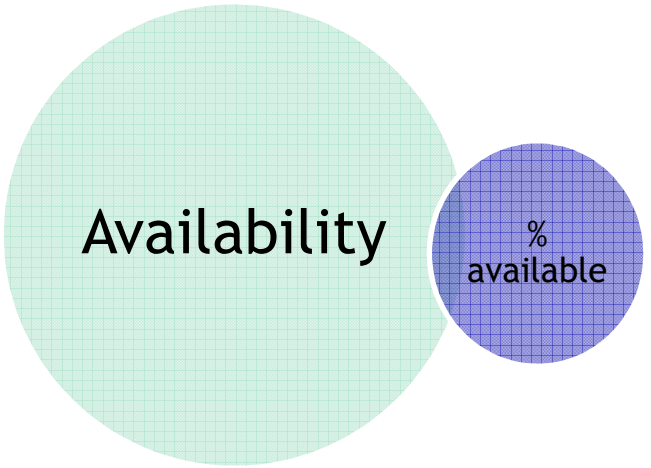


Availability

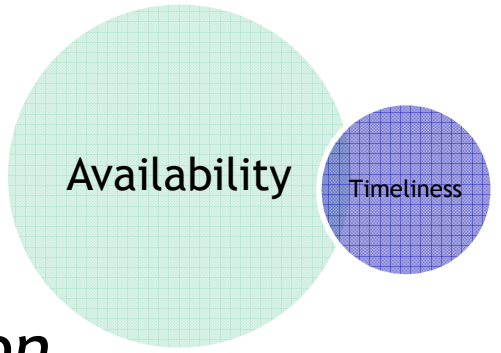
The designed availability for a real-time information program shall be 90 percent available at a minimum.

Implementation Guidance:

- *System "up time" or*
- *how often users' queries are successful*



Timeliness

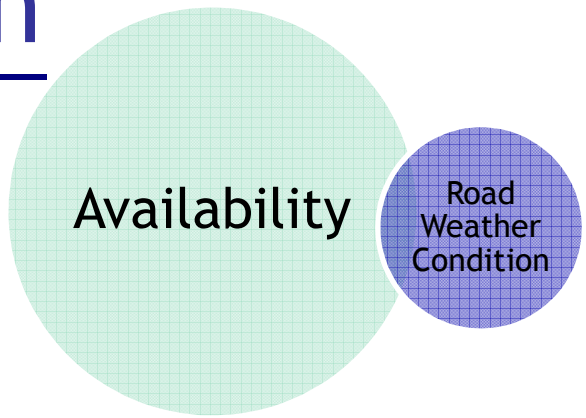


Timeliness for "availability" may be thought of as when such information would be available in a database from which users could query and "pull" such information.

*From **confirmation** of the "event", the information must be made available within the following time periods. (Weather is 20 minutes)*

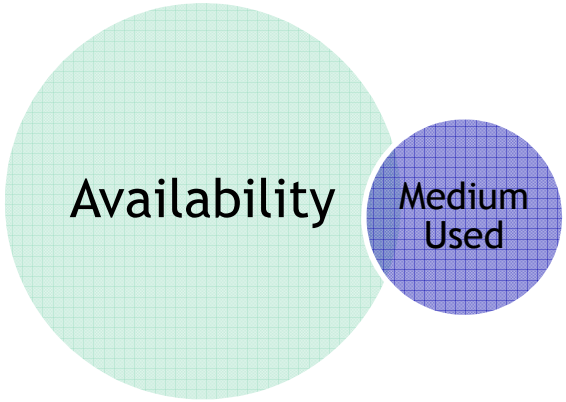
- Urban areas – 10 minutes
- Rural areas – 20 minutes

Road Weather Condition



- Closure
- Restrictions (example)
  - Weight
- Hazardous Road Conditions (examples)
  - Visibility
    - Fog
    - Blowing Snow or Sand
  - Slick Roads
    - Ice
    - Snow
  - Flooded Roads

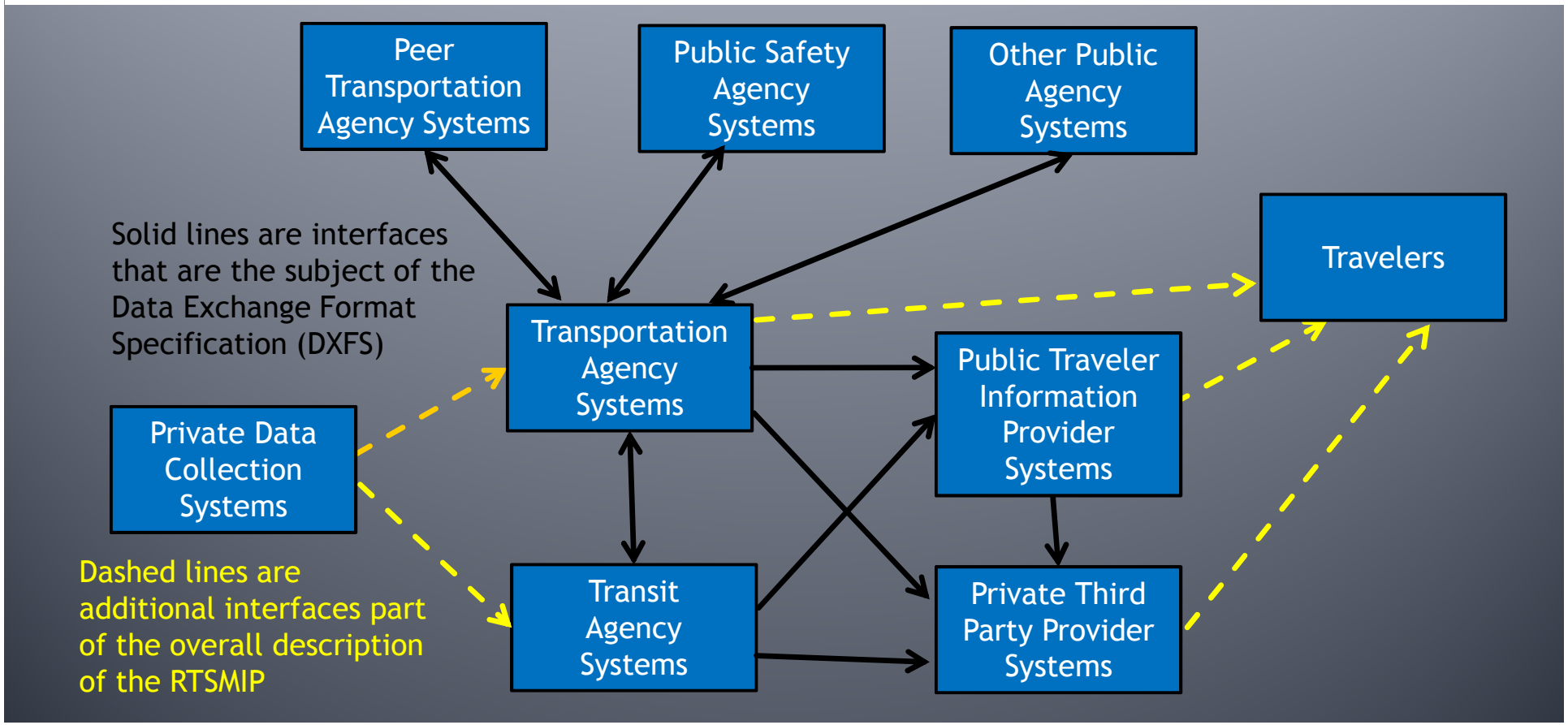
Medium Use



- Minimum Requirement
  - Available to Others thru mediums such as a database, ftp site, xml file, etc.
- Other Mediums to Consider
  - Website
  - 511
  - DMS
  - HAR
  - Social media
  - Broadcast community

Create a RTSMIP Weather Procedure

Real-Time System Management Information Program (RTSMIP)



Road Weather Conditions

- Establish the Road Weather Conditions to include in the RTSMIP for the following categories:
  - Closures
  - Restrictions
  - Hazardous Conditions

Collection Method

- Identify where the information will come from for the identified road weather condition
  - Closure might be the highway patrol
  - Restriction might be a published schedule or from subsurface temperature sensors
  - Hazardous condition might be from RWIS sensors, field personnel, etc.

Confirmation Method

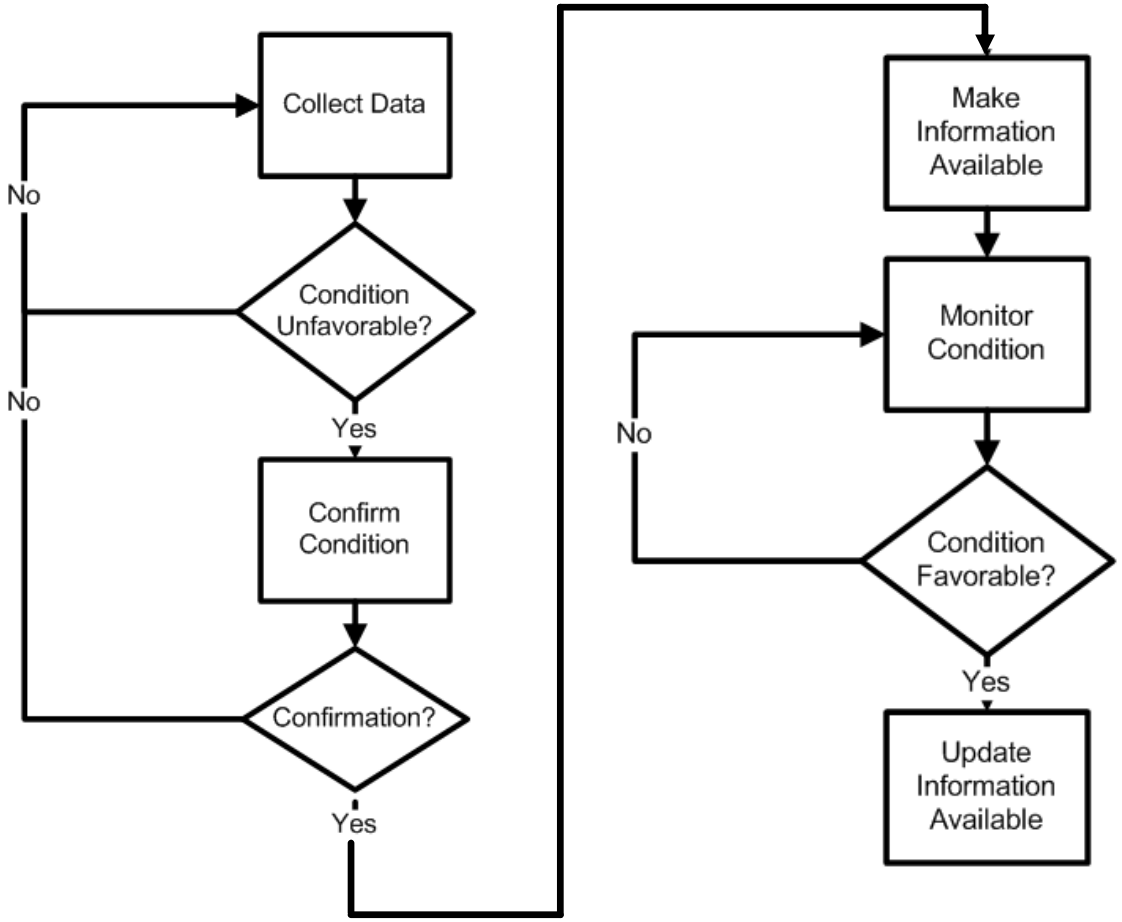
- Identify how you are going to confirm the information for inclusion and within in the RTSMIP
- Examples might be ~
  - Cameras on an ESS
  - Field Personnel

Information Availability Method

- Establish responsibilities for making the confirmed information into the RTSMIP (automatically or manually)
- Establish dissemination mediums that are required by the DOT's procedure based on the road weather condition above & beyond the "database" required by the rule
  - Example: road closure – available DMS & 511
- Update the information within the RTSMIP and other dissemination as conditions change

Train

- Create tools
  - Procedure
  - Flowcharts



Weather-related Guidance for the Real-Time System Management Information Program (1201 Rule)

National Transportation Communications for ITS Protocol 1204 version 04

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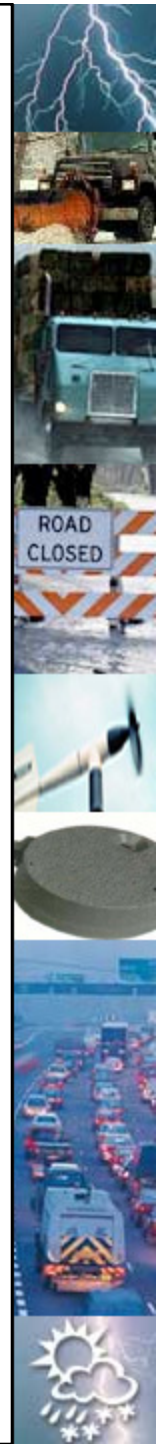
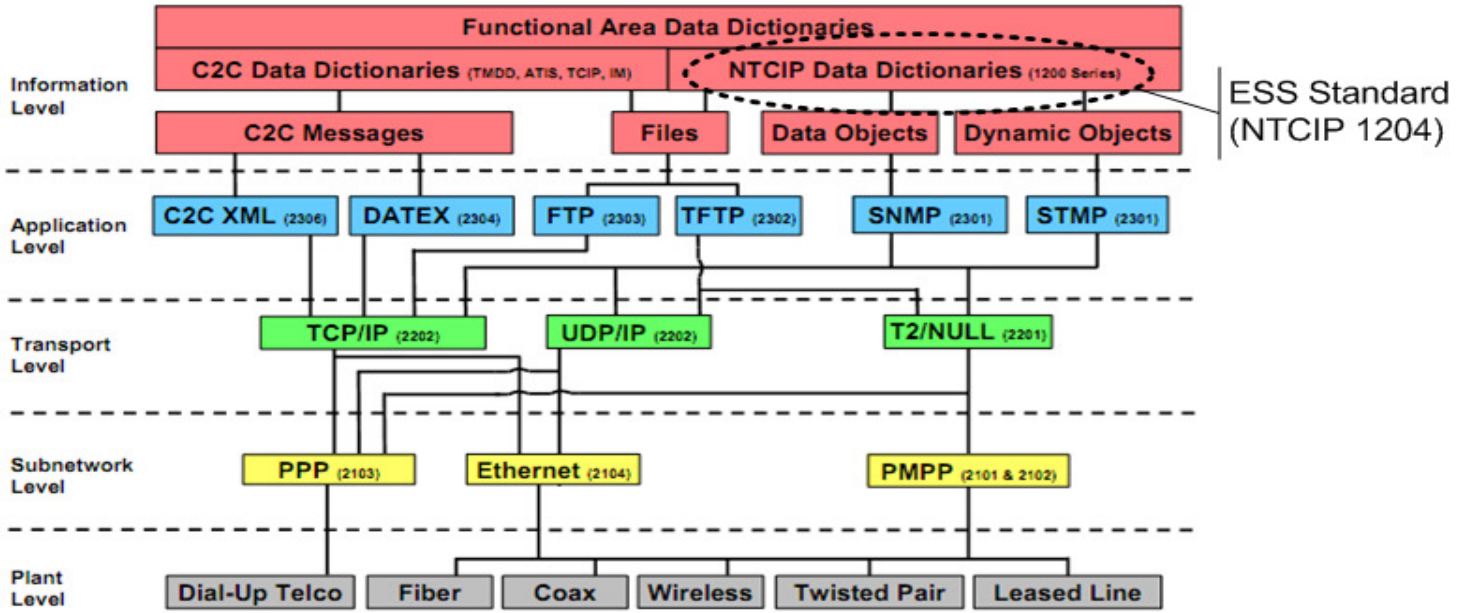


What is NTCIP 1204?

- Defines a (communications) interface standard
- Specifies the interface between the environmental sensor stations (ESS) and monitoring systems
- Contains the object definitions (vocabulary) used to monitor an ESS

NTCIP Family

- NTCIP (National Transportation Communications for ITS Protocols): a family of standards for the ITS industry
  - Information profile standards – called objects
  - Underlying communications standards – called protocols
- NTCIP 1204 is an Information Content standard



History of NTCIP 1204

- **1996:** an agreement among AASHTO, ITE, and NEMA was executed to jointly develop, approve, and maintain the NTCIP.
- **1998:** NTCIP 1204 version 01 was published (NTCIP 1204:1998).
- **2001:** update and enhance the standard to reflect lessons learned; to update to new documentation formats; to add new features. The resulting NTCIP 1204 version 02 published in 2005.
- **2006:** major revisions were the inclusion of test procedures. Completed in 2008 and "NTCIP 1204 v03 *ESS Interface Protocol*" published in November 2009.

Next Steps… NTCIP 1204 ESS v4

2012: efforts will be underway by both AASHTO & ITE to make some modifications to the standard to reflect recent advancements in environmental sensing technology.

- **Proposed Task Order Start Date:** We hope shortly…
- **Proposed Task Order End Date:** 18 months after *A*ward

Tasks to revise the:

- ✓ Concept of Operations
- ✓ Software Requirements Specification
- ✓ System Design Description
- ✓ Test Procedures

Gaps to be addressed by the NTCIP 1204 v4

Many connected vehicle applications need environmental information that convey the current weather and road condition information. Appropriate monitoring, control, and management of Environmental Sensor Stations are essential.

- ✓ **Safety…** that reduce crashes, based on road conditions.
- ✓ **Mobility…** that use real-time data from to indicate road conditions prior to or during a trip.
- ✓ **Environment…** that enable reduced fuel consumption and/or reduced criteria pollutant emissions.